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IS 11792 (1986): Steel ball valve for the petroleum petrochemical and allied industries [MED 17: Chemical Engineering Plants and Related Equipment]

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AMENDMENT NO. 1 AUGUST 1996
TO
IS 11792 : 1986 SPECIFICATION FOR STEEL BALL VALVES FOR THE PETROLEUM, PETROCHEMICALS AND ALLIED INDUSTRIES

(*Page* 4, *clause* **4.4.2**) — Substitute the following for the existing:

'**4.4.2** The design shall ensure that stem shall not be capable of ejection from valve while valve is under pressure by removal of stem seal retainer alone.'

(*Page* 9, *clause* **4.10.1**) — Insert following new clause after **4.10.1**:

'**4.10.2** Conductive packings/seals may also be used provided they can not be removed by removing the gland/seal alone.'

(HMD 17)

Reprography Unit, BIS, New Delhi, India

UDC 621·646·616 : [669·14] : 665·6/·7 (First Reprint APRIL 1999) REAFFIRMED 2003 **IS : 11792 - 1986**
(Reaffirmed 1998)

Indian Standard

SPECIFICATION FOR STEEL BALL VALVES FOR THE PETROLEUM, PETROCHEMICALS AND ALLIED INDUSTRIES

1. Scope — Specifies requirements for carbon steel straightway port ball valves with flanged, butt weld, screwed or socket-weld ends, in nominal sizes DN 6 to DN 400 and classes 150, 300, 600 and 800.

1.1 Flanged end valves, primarily intended for assembly with flange sizes 15 to 400 mm in classes 150, 300 and 600.

1 2 Butt-weld end valves, primarily intended for assembly with bevelled-end pipe as given in IS : 11790-1986 Code of practice for butt welding ends for pipes, valves, flanges and fittings in sizes 50 to 400 mm in classes 150, 300 and 600.

1.3 Screwed-end-valves, intended for assembly with pipe thread according to IS : 3333 (Part 1)-1967 Dimensions for petroleum industry pipe threads: Part 1 Line pipe threads in sizes 6 to 50 mm in class 800.

1.4 Socket weld end valves, intended for assembly with plain end pipe in accordance with IS : 4712-1984 'Specification for forged steel socket-welding fittings (*first revision*)', in sizes 6 to 50 mm in class 800.

1.4.1 Weld-end valves with extended ends in sizes DN 6 to DN 50 in class 800.

1 5 Reduced bore and full bore pattern valves are included with either a seat supported ball or a trunnion supported ball and of either a one-piece or split body construction. Typical ball valve construction are shown in Fig. 1 to 4.

1.6 This standard applies to valves of the following pressure class designations:

Class 150, 300, 600 and 800.

2. Pressure/Temperature Rating — The pressure and temperature ratings for ball valves depends on the materials of the body seat rings. The minimum ratings shall be as in Table 1. Higher rating may be used subject to manufacturer's recommendations. Other than body seat rings and primary soft seals, all valves components shall be able to withstand the pressure/temperature ratings of the body for the class of valve concerned. Primary soft seals shall be able to withstand the appropriate hydrostatic body test pressure and shall have pressure/temperature ratings not less than the body seat ring rating or body rating, whichever is less.

3. Nominal Sizes — Valves of the nominal sizes DN 6, 10, 15, 20, 25, 32*, 40, 50, 65*, 80, 100, 125, 150, 200, 250, 300, 350 and 400 are specified.

4. Design — Valves shall be designed as either reduced bore or full bore pattern as in Table 2.

4.1 Valves shall be designed to ensure that the ball port shall be in alignment with the body throat ports in the fully open position.

4.2 *Body, Body Connector, Insert and Cover* — The body shall be so designed that the pressure loss as well as corrosive and erosive effects are minimum. In the case of the full bore valves the port shall be cylindrical.

4.2.1 The valve shall be designed such as to provide adequate resistance against any permanent distortion under hydrostatic test conditions or against distortion under working conditions which would impair satisfactory operation of valve. This is particularly important in the case of split body type valves since the design strength of the split body joint or joints must be better than that of the body end joint.

4.2.2 Face-to-face dimensions for flanged-end valves and end to end dimensions for butt-weld end valves shall conform to IS : 9884-1981 'Dimensions for ferrous valves—face-to-face and end-to-end.

Industrial Valves Sectional Committee, EDC 81 [Ref : Doc : EDC 81 (4097)]

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*Non-preferred sizes.

Adopted 8 August 1986	© July 1987, BIS	Gr 5

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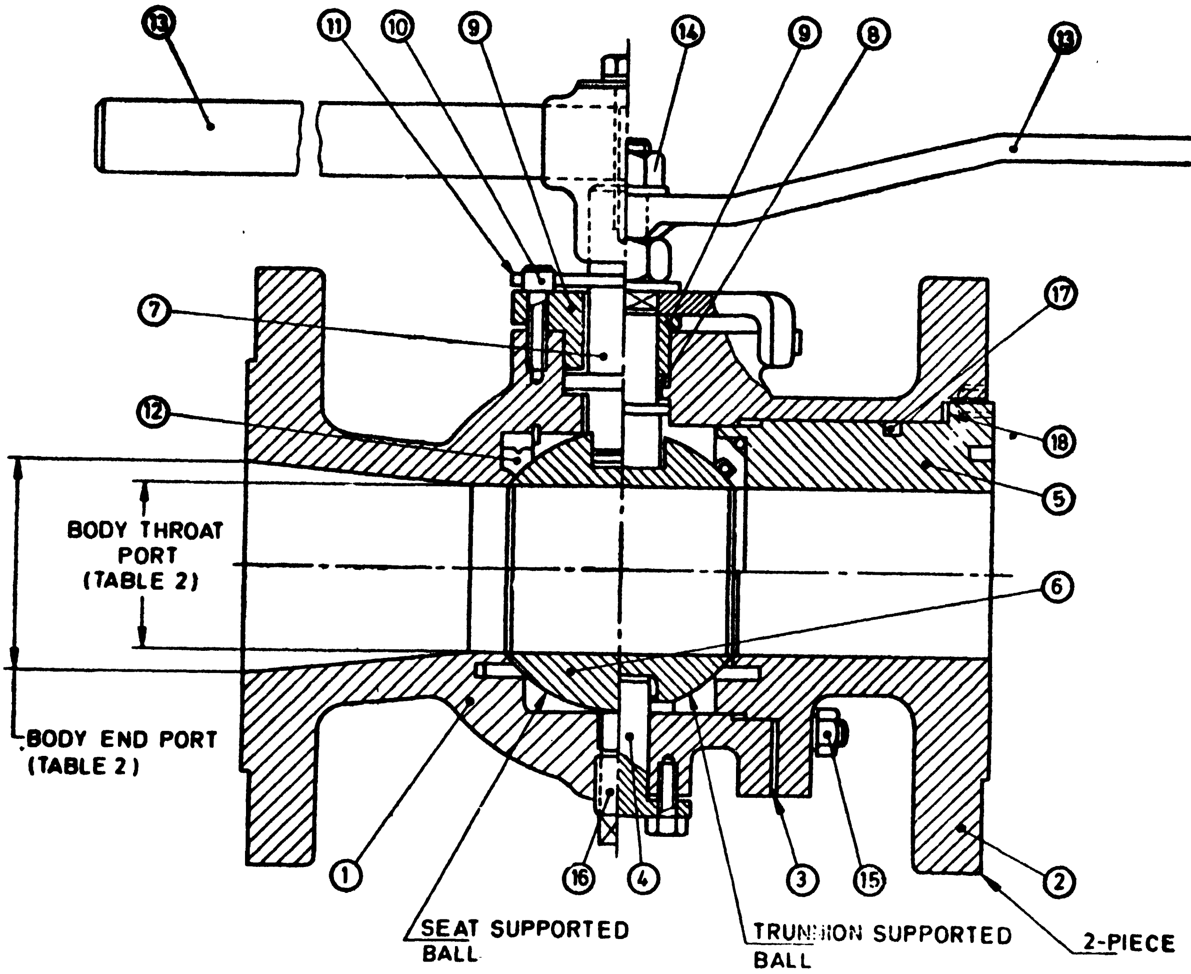


Part Ref	*Name of Part*	*Part Ref*	*Name of Part*
1	Body	10	Gland bolts
2	Body connector	11	Indicator
3	Body connector gasket	12	Body seat rings
4	Trunnion	13	Wrench
5	Insert	14	Wrench nut
6	Ball	15	Body connector bolting
7	Stem	16	Body plug
8	Stem seal	17	Insert seal
9	Gland	18	Firesafe gasket

Note — This sketch is composite for the purpose of showing some typical variations in individual details. A product utilising any combination of these details (except when such combination may be specifically prohibited in the text) or similar construction will be acceptable provided it complies with this standard in all other respects.

FIG. 1 END ENTRY/SPLIT BODY VALVES

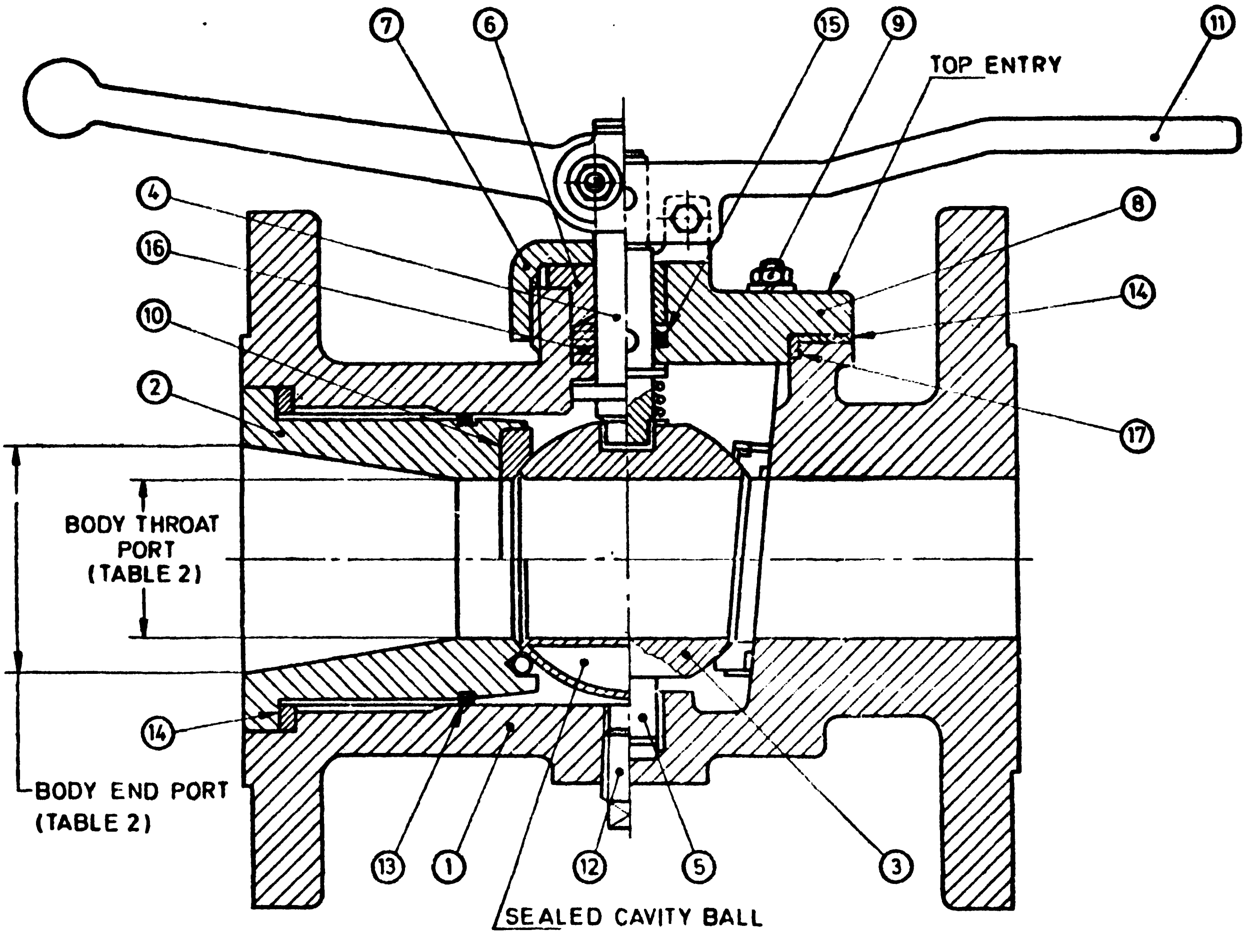
4.2.3 End flanges shall be cast or forged integral with the body except that flanges may be attached by welding if so specified in the purchase order. The welds of end flanges attached by butt welding shall conform to the requirements of Indian Standard specification for steel pipe flanges and flanged fittings (*under preparation*). Flange attachment by other welding processes shall be the subject of agreement between the manufacturer and the purchaser.

4.2.4 End flanges shall conform to Indian Standard specification for steel pipe flanges and flanged fittings (*under preparation*).

4.2.5 In the case of class 150 short pattern valves, the ball may protrude beyond the body and flange faces when the valve is in the closed position.

4.2.6 Butt-weld ends shall conform to the details as given in IS : 11790-1986. Pipe schedule number or pipe wall thickness and outside diameter of the pipe shall be specified by the purchaser.

4.2.6.1 Screwed-end details shall conform to the requirements of IS : 3333 (Part 1)-1967 and socket and welding-end details shall be as given in Table 3.



Part Ref	*Name of Part*	*Part Ref*	*Name of Part*
1	Body	10	Body seat rings
2	Insert	11	Wrench
3	Ball	12	Body plug
4	Stem	13	Insert seal
5	Trunnion	14	Fire safe gasket
6	Gland	15	Stem seal
7	Gland nut	16	Gland packing
8	Cover	17	Cover seal
9	Cover bolting		

Note — This sketch is composite for the purpose of showing some typical variations in individual details. A product utilizing any combination of these details (except when such combination may be specifically prohibited in the text) or similar construction will be acceptable provided it complies with this standard in all other respects.

FIG. 2 END/TOP ENTRY/ONE PIECE BODY VALVES

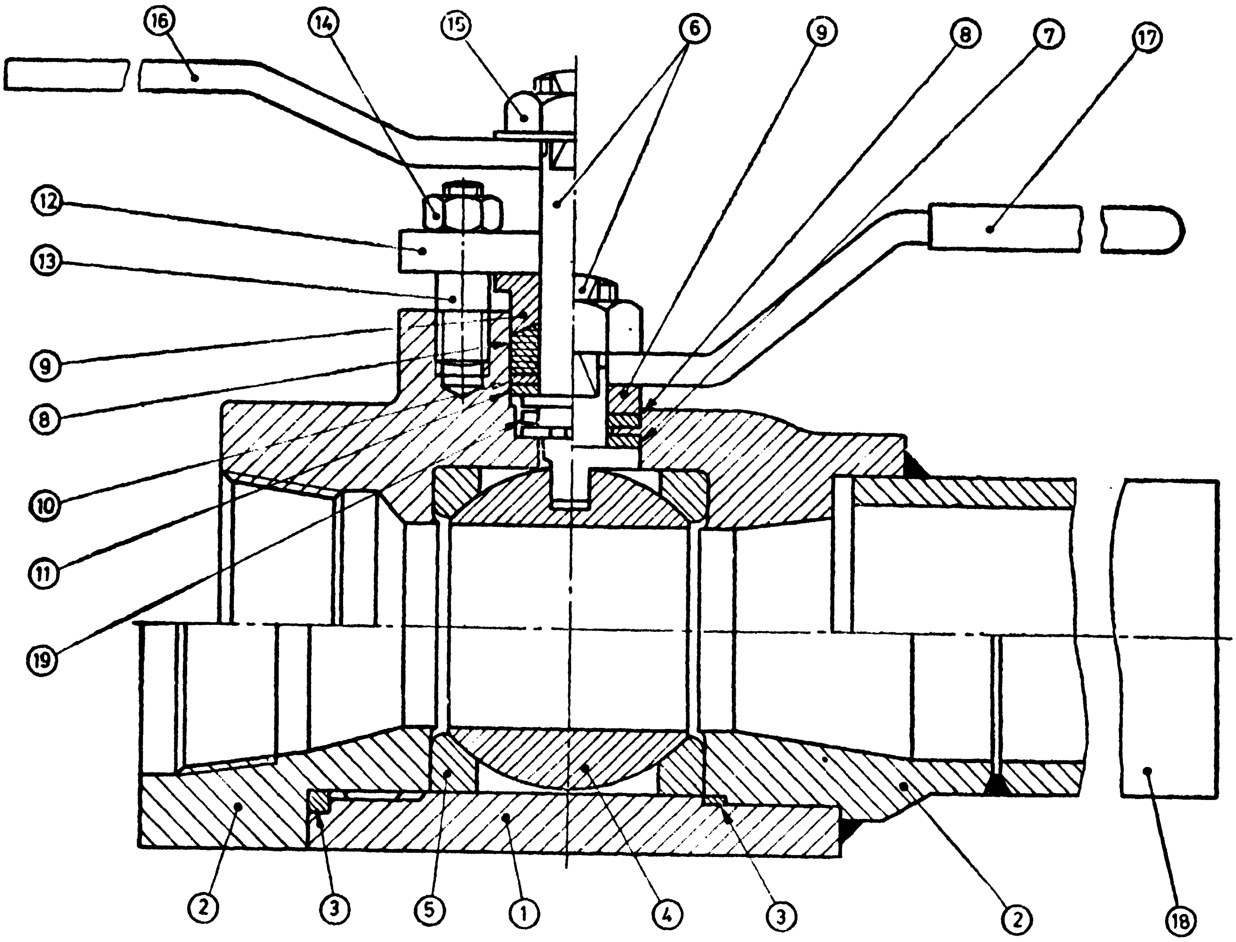
4.2.7 The design of the body of valves of nominal size 50 mm and larger shall be such that it will permit to have a drain tapping at the bottom of the body when specified.

4.2.7.1 For valves of nominal sizes 40 mm and smaller, provisions for the tapping shall be by agreement between the purchaser and the manufacturer. The hole may be tapped in the wall of the body if the metal thickness is sufficient for the size and minimum effective length of thread. Provision shall be made for the body tappings according to IS : 9625-1980 ' Locations of by-pass and drain connections for valves '. Tapping threads shall be in accordance with IS : 554-1975 ' Dimensions for pipe threads where pressure tight joints are required on the threads (*second revision*).

A boss shall be provided in such cases where the wall thickness is insufficient or where the tapped-hole needs reinforcement.

4.2.8 Not less than four bolts, stud-bolts, studs or socket head cap or hexagon headed screws are necessary for bolted covers.

4.2.9 Normal unscrewing or screwing in of the connecting pipework in screwed and valves shall not adversely affect any joints between the body, body connectors or inserts.



Part Ref	Name of Part	Part Ref	Name of Part
1	Body	11	Location washer
2	Body connector	12	Gland flange
3	Body connector seal	13	Gland bolt
4	Ball	14	Gland nut
5	Body seat ring	15	Wrench nut
6	Stem	16	Wrench
7	Stem seal	17	Wrench sleeve
8	Gland packing	18	Extended end
9	Gland	19	Stem retaining pin
10	Thrust washer		

FIG. 3 SPLIT BODY TWO PIECE AND ONE PIECE SEALED BALL VALVES SCREWED AND EXTENDED WELD END

4.2.10 Over-pressure of the body cavity shall be prevented by suitable arrangement when specified by the purchaser.

4.2.11 The body shall conform to the shell thickness as in Table 4. Drilling or pinning for name plate fixing shall not reduce the effective thickness below the minimum permitted value as in Table 4.

4.3 *Ball*

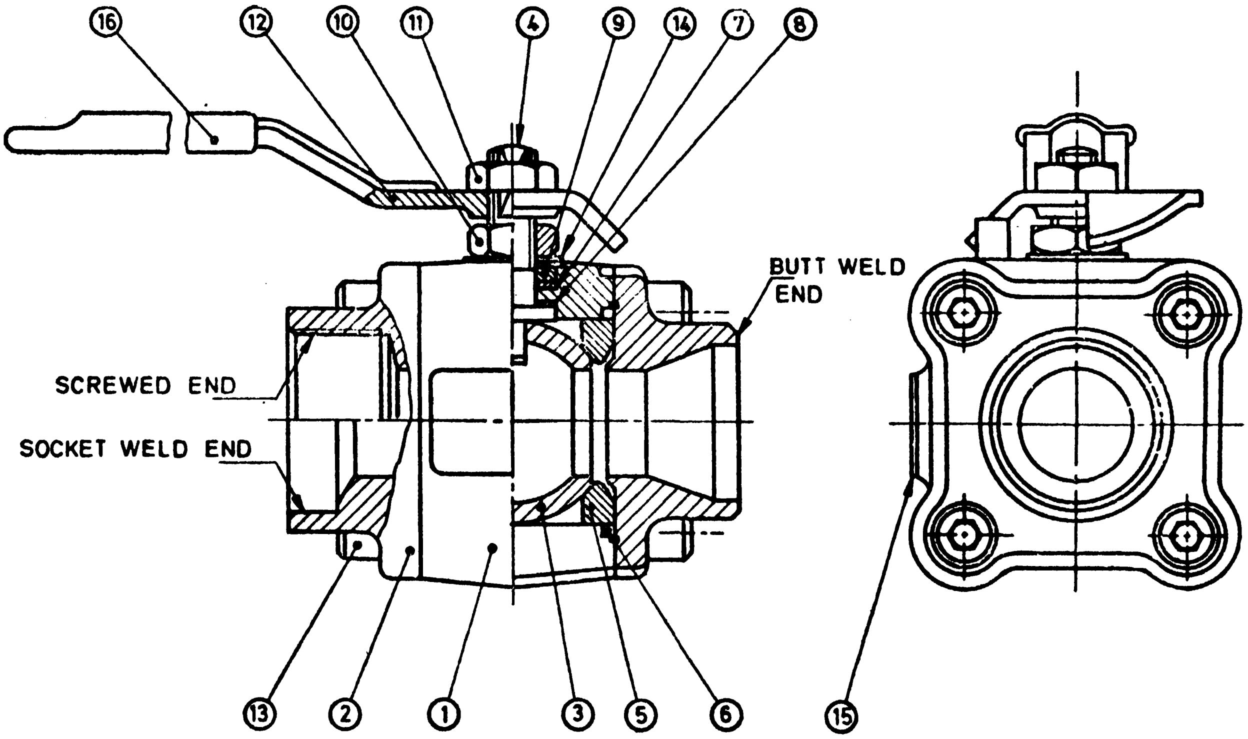
4.3.1 The ball port shall be cylindrical in full bore valves. Sealed cavity shall be designed to withstand full hydrostatic test pressure.

4.3.2 The purchaser shall state in the order if a cylindrical ball port is required in a reduced bore valve.

4.4 *Stem (or Ball Shank)*

4.4.1 The size of stem (or ball shank) shall be such that its section and connection to the ball is capable of withstanding the maximum operating torque that may be encountered in service.

4.4.2 Retention of the stem shall be ensured by providing means other than adjustable gland components.



Part Ref	*Name of Part*	*Part Ref*	*Name of Part*
1	Body	9	Gland
2	Body connector	10	Gland nut
3	Ball	11	Wrench nut
4	Stem	12	Wrench
5	Body seat ring	13	Body connector bolting
6	Body connector seal	14	Disk spring
7	Gland packing	15	Body marking plate
8	Stem seal	16	Wrench sleeve

FIG. 4 SPLIT BODY BALL VALVE SANDWICH CONSTRUCTION

4.5 *Gland*

4.5.1 The gland shall be of the bolted type or screwed.

4.5.2 An internally screwed stuffing box is not permitted.

4.5.3 The bolted type may be of one-piece, one-piece bushed or of two-piece self-aligning type.

4.5.4 Vertically split glands shall not be used.

4.5.5 Gland bolts shall pass through holes in the gland and not slots.

4.6 *Body Seat Rings*

4.6.1 Renewable body seat rings or seat ring assemblies shall be supplied, unless otherwise agreed between the purchaser and the manufacturer, on all valves except for those having a one-piece sealed body construction.

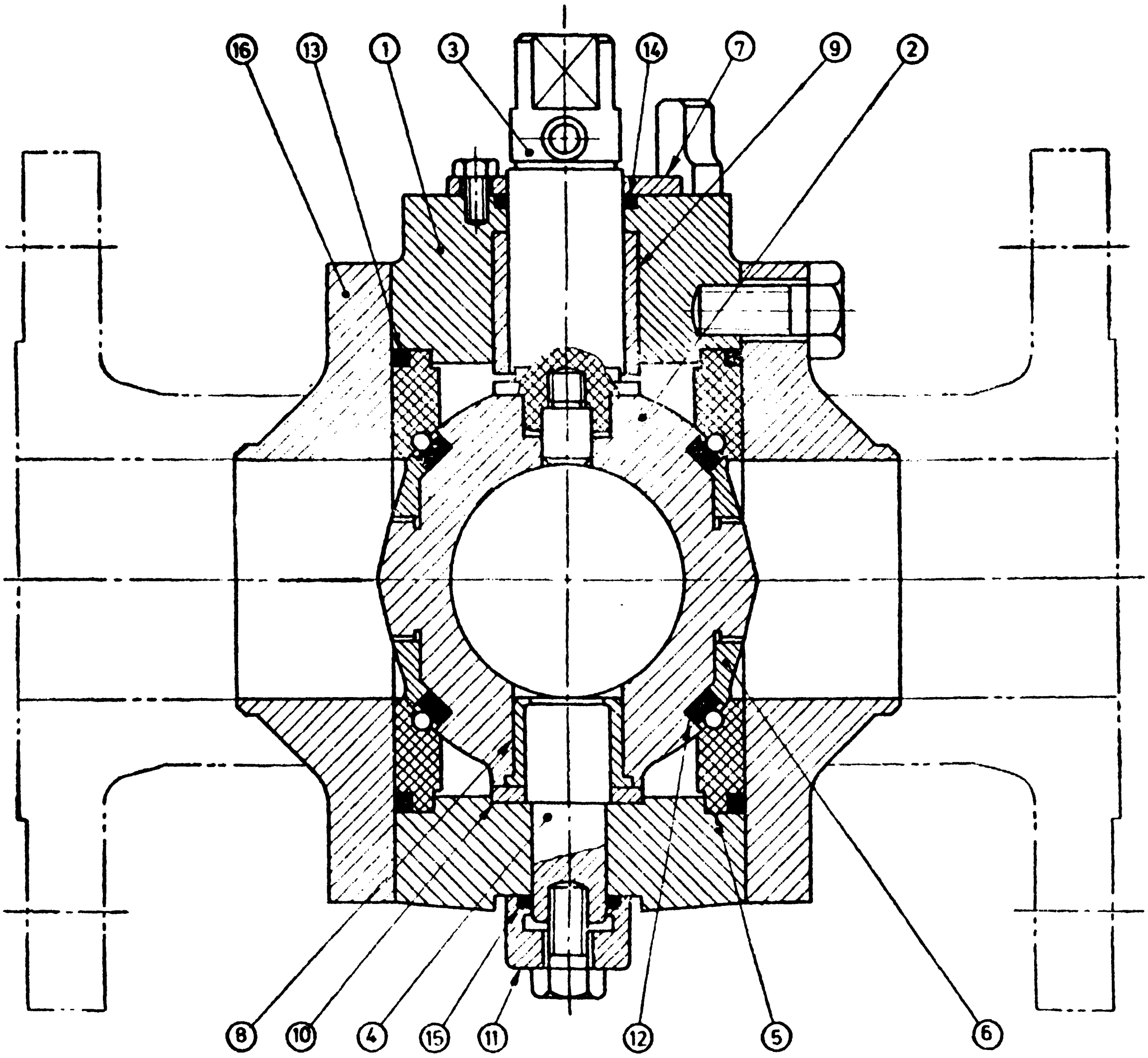
4.6.2 If soft seats are given on the ball and metallic seats in valve body, then the seats on the ball must be replaceable (Fig. 5).

4.7 *Bolting*

4.7.1 Bolts and nuts shall conform to IS : 1364-1983 'Hexagon head bolts, screws and nuts of products, grades A and B'.

4.8 *Operation*

4.8.1 The length of the wrench or the diameter of the handwheel for direct manual or gear-operated valves shall be such that a force not exceeding 350 N shall be required to operate the ball in either bits open or closed position under the maximum differential pressure recommended by the manufacturer.



Part Ref	Name of Part	Part Ref	Name of Part
1	Body	9	Upper bush
2	Ball	10	Washer
3	Upper shaft	11	Bottom cap
4	Lower shaft	12	Soft seal
5	Body seat ring	13	'O' ring for soft seal & body
6	Seal retaining ring	14	'O' ring for upper shaft
7	Gland plate	15	'O' ring for lower shaft
8	Lower bush	16	Side flange

FIG. 5 TYPICAL ARRANGEMENT OF BALL VALVE WITH SOFT SEAT ON BALL AND METAL SEATS IN VALVE BODY

4.8.2 The wrench shall be designed so that it is parallel to the flow passage of the ball.

4.8.3 The valve shall be closed by turning the wrench or the handwheel in a clockwise direction. Handwheels shall be suitably marked with an arrow and the word 'closed' or 'open' to indicate the direction of valve closing.

4.8.4 Handwheels and wrenches shall be fitted in such a way that, whilst held securely, they may be removed and replaced when necessary. Suitable stops shall be provided for both fully open and fully closed position of the valve.

4.8.5 Stems, ball shanks, stem extensions, stem-mounted handwheels or other attachments shall be provided with permanent means of indicating port position and shall be designed positively to prevent misorientation.

TABLE 1 MINIMUM PRESSURE TEMPERATURE SEAT RATINGS FOR BALL VALVES

(*Clause* 2)

Nominal Size of Valve (DN) mm		Service Temperature, °C									
		—30 to 40	50	75	90	100	125	150	175	200	230
Full bore	Reduced bore	Minimum Non-shock Pressure, Bar									
6 to 20	6 to 25	69	66	56	51	47	38	29	20	11	0
25 to 65	32 to 80	50	49	48	48	47	38	29	20	11	0
80 to 100	100 to 150	42	42	42	42	39	32	24	17	9	0
150 to 200	200 to 250	31	31	31	31	29	23	18	12	7	0
200 to 400	300 to 400	21	21	21	21	20	16	12	8	5	0

Note : The pressure/temperature ratings specified in Table 1 are based on the use of virgin unfilled PTFE.

TABLE 2 MINIMUM BALL AND BODY PORT DIAMETERS CLASSES 150, 300, 600 and 800

(*Clause* 4)

All dimensions in millimetres.

Nominal Size of Valve	Reduced Bore Valve	Minimum Diameter		
		Full Bore Valve		
		Class 150	Class 300	Class 600 and 800
6	6	6	6	6
10	6	9·5	9·5	9·5
15	9·5	12·5	12·5	12·5
20	12·5	19	19	19
25	17	25	25	25
40	30	38	38	38
50	36·5	51	51	51
80	58	76	76	76
100	76	102	102	102
150	111	152	152	152
200	144	203	203	200
250	187	254	254	248
300	241	305	305	298
350	267	337	337	327
400	305	387	387	375

TABLE 3 SOCKET DIMENSIONS

(*Clause* 4.2.6.1)

All dimensions in millimetres.

Nominal Size of Valve	Socket Dimensions		
	Bore $^{+0\cdot25}_{-0\cdot00}$	Depth, *Min*	Socket Wall Thickness
6	14·1	10·0	3·3
10	17·6	10·0	3·5
15	21·8	10·0	4·1
20	27·1	13·0	4·3
25	33·8	13·0	5·0
32	42·6	13·0	5·3
40	48·7	13·0	5·6
50	61·1	16·0	6·1

TABLE 4 SHELL THICKNESS

(*Clause* 4.2.11)

All dimensions in millimetres.

Nominal Size of Valve	Minimum Shell Thickness			
	Class 150	Class 300	Class 600	Class 800
6	—	—	—	3·3
10	—	—	—	3·5
15	4·0	4·0	5·0	4·0
20	4·0	4·0	5·0	4·3
25	5·0	5·0	6·0	5·0
40	6·0	7·0	7·0	5·6
50	7·0	8·0	8·0	6·1
80	7·0	9·0	10·0	—
100	8·0	10·0	12·0	—
150	9·0	12·0	16·0	—
200	10·0	14·0	20·0	—
250	11·0	16·0	23·0	—
300	12·0	18·0	27·0	—
350	13·0	20·0	29·0	—
400	14.0	22·0	32·0	—

4.8.6 If actuator operation is required, the details of the actuator and its power supply together with the design maximum pressure differential across the valve shall be specified in the purchase order.

4.9 *Fire-Safe Design*

4.9.1 All valves shall be fire-safe conforming to Indian standard specification for fire-safe test for ball valves with soft seats (*under preparation*).

4.10 *Anti-static Device*

4.10.1 All valves shall be fitted with an anti-static device which shall incorporate suitable features in its design to ensure electrical continuity between the ball stem and body of the valve, except for valve sizes DN50 and below where continuity between stem and body only is required. The essential features of any device shall also fulfil the following requirements:

a) Have a discharge path from the ball to the spindle and from the spindle to the valve body with an electrical resistance of not greater than 10 ohms when the valve is new and operated under agreed prototype test conditions.

b) Be of such a design that the valve cannot be assembled, or re-assembled, without the device.

A typical method of achieving earthed continuity is to provide stainless steel spring loaded plungers, one fitted between the stem tongue and ball, and second fitted between the stem and body.

5. Material

5.1 *Body, Body Connector, Insert and Cover*

The body, body connector, insert and cover shall be of the material specified in the purchase order. The material may be cast or forged unless a preference is specified in the purchase order.

The cover may be made of suitable wrought steel in place of the comparable cast or forged steel when specified in the purchase order.

5.2 *Body-Seat Rings and Housing*

5.2.1 This is based on soft seat rings processed from PTFE oil-free granular resins without fillers which shall be virgin material completely free of any reclaimed processed material.

5.2.2 The purchaser shall have the option of calling for test certificates to confirm that the necessary quality control of the seat material and its processing has been exercised by the valve manufacturer. Seat rings in materials other than virgin PTFE shall be by agreement between the purchaser and the manufacturer.

5.2.3 Housing, if fitted, shall be of a material at least equal to that of the ball.

5.3 *Ball (or Ball and Shank)*

5.3.1 The ball shall be of material at least equal to that of the shell. The surface of carbon steel balls wiped by the seat shall be rust proofed by an acceptable process.

5.4 *Wrench and Handwheel*

5.4.1 The wrench or handwheel shell be of steel, malleable iron, nodular iron or fabricated steel.

5.5 *Wrench and Handwheel Nut*

5.5.1 The wrench or handwheel nut shall be of copper alloy, steel, malleable iron or nodular iron. It shall be suitably protected from atmospheric conditions if made of carbon steel.

5.6 *Gland*

5.6.1 A one-piece gland or any gland flange shall be of steel. The bushing of a one-piece bushed gland or the gland proper of a two-piece gland shall be made of a material having a melting point above 955°C.

5.7 *Stem*

5.7.1 The stem shall be of material at least equal to that of the shell. Carbon steel stems shall be rust proofed by an acceptable process.

5.8 *Stem Seal—Body Seals and Gaskets*

5.8.1 Materials shall be to manufacturer's standard and shall be suitable for use at operating temperatures of at least up to 230°C and meet the fire-safe requirements. The use of higher packing temperatures shall be subject to agreement between the manufacturer and the purchaser.

5.8.2 They shall also be suitable for the pressure/temperature rating of the valves.

5.8.3 Any metallic part of the gasket shall have at least the same corrosion resistance as the shell.

5.9 *Bolting*

5.9.1 The materials for bolting (other than nuts) of pressure containing parts shall be Grade 40Cr4Mo3 of IS : 1570 and for nuts at least equal to IS : 1570 Gr 45C8 or 55C8 except that on class 150 valves carbon steel bolting of minimum tensile strength 430 N/mm^2 is permitted up to 230°C operating temperature, unless stated otherwise in the purchase order.

5.9.2 The material for gland and other bolting shall have a minimum tensile strength of 390 N/mm^2. If different bolting is fitted because of design or performance requirements it shall be readily identifiable.

5.10 *Trunnion*

5.10.1 The material of the trunnion shall be at least equal to that of the body.

5.11 *Name Plate*

5.11.1 The name plate material and attachment shall be of corrosion resistant material to the manufacturer's standard.

6. Marking

6.1 The valves shall be marked as specified in IS : 9866-1981 'Marking systems for valves'.

6.2 *ISI Certification Marking* — Details available with the Bureau of Indian Standard.

7. Inspection and Test

7.1 *Inspection* — If inspection by purchaser's inspector is specified in the purchase order, inspection shall be as specified in IS : 6157-1981 'Valve inspection and test'. If this inspection is not specified, the valve shall meet requirements for visual examination described in IS : 6157-1981.

7.2 *Pressure Test* — The pressure test shall be according to IS : 6157-1981.

8. Shipment — All valves shall be thoroughly cleaned and dried after testing and prior to shipment.

8.1 The valves specified in this standard shall not be painted, unless specifically asked for.

8.2 The valves shall be shipped in open position of ball, glands fully packed and all openings (body ends) properly closed to preclude any dirt or foreign matter from the interior of the valve.

8.3 All machined surfaces and threaded parts shall be suitably protected with approved rust preventive.

8.4 The valves shall be shipped in wooden crates, packed in a manner to prevent shifting within the crate.

8.5 The valves shall be shipped with handwheels or wrenches removed to prevent damage to same. The handwheels shall be secured to the valves by wires or other suitable means or may be packed in a separate box depending on convenience. Alternate methods of shipment other than specified above shall be subject to mutual agreement between manufacturer and purchaser.

9. Guarantee

9.1 The manufacturer shall, by acceptance of purchaser's order, guarantee the material, the design and the operation of the valves covered by the order to the extent that, if any defect or defects attributable to faulty workmanship, design or material are found in the valves, within a period of one year after they are placed in regular service or two years from the date of receipt of the valves, the manufacturer, shall furnish free of charge at the original point of delivery, any part or parts thereof that prove defective, provided the valves have not been misused or abused and have been installed in the service for which they were recommended. If any valve is found to be defective prior to placement in service, the same shall be replaced by the manufacturer, free of cost within a reasonable time.

EXPLANATORY NOTE

In the preparation of this standard considerable assistance has been derived from BS 5351-1976 'Steel ball, valves for the petroleum, petrochemicals and allied industries' issued by the British Standards Institution.

Reprography Unit, BIS, New Delhi, India